

WHAT IS CLAIMED IS:

1. A non-aqueous rechargeable lithium battery having reduced capacity fade rate
5 during cycling, the battery including a lithium insertion compound cathode, a lithium or lithium compound anode, a separator, a non-aqueous electrolyte including a lithium salt dissolved in a non-aqueous solvent, and an amount of lithium borate dispersed on the surface of the active cathode material wherein:
lithium borate is mixed with the lithium insertion compound cathode
10 and heated to a temperature in the range between 250°C to less than 650°C.
2. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the
15 mixture of lithium borate and the lithium insertion compound cathode is heated at greater or equal to 250°C.
3. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein an aqueous lithium borate solution is mixed with the lithium insertion compound cathode.
- 20 4. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein a small amount of lithium borate and the lithium insertion compound cathode are dry-mixed in a jar mill with media.
5. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the
25 amount of lithium borate is greater than about 0.01%, but less than 2% of the weight of the lithium insertion compound cathode.
6. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the
30 lithium insertion compound cathode is a lithium transition metal oxide cathode with LiCoO₂ type structure.
7. A non-aqueous rechargeable lithium battery as claimed in claim 6 wherein the
lithium transition metal oxide is a member of the solid solution series LiNi_xCo_{1-x}O₂ ($0 \leq x \leq 1$).
- 35 8. A non-aqueous rechargeable lithium battery as claimed in claim 6 wherein the lithium transition metal oxide is LiCoO₂.

9. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the anode comprises a carbonaceous insertion compound.

10. A non-aqueous rechargeable lithium battery as claimed in claim 9 wherein the carbonaceous insertion compound is graphite.

11. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the lithium salt is LiPF_6 .

12. A non-aqueous rechargeable lithium battery as claimed in claim 1 wherein the non-aqueous solvent comprises a cyclic and/or linear organic carbonate.

13. A non-aqueous rechargeable lithium battery as claimed in claim 12 wherein the non-aqueous solvent is a mixture of ethylene carbonate, propylene carbonate, diethyl carbonate, ethyl methyl carbonate, and dimethyl carbonate.

14. A method for reducing the capacity fade rate during cycling of a non-aqueous rechargeable lithium battery, the battery having a lithium insertion compound cathode, a lithium or lithium compound anode, a separator, and a non-aqueous electrolyte including a lithium salt dissolved in a non-aqueous solvent, and an amount of lithium borate in the cathode, wherein lithium borate is mixed with the lithium transition metal oxide cathode and heated to a temperature in the range between 250°C and less than 650°C .

15. A method as claimed in claim 14 wherein the mixture of lithium borate and the lithium insertion compound cathode is heated at greater or equal to 250°C .

16. A method as claimed in claim 14 wherein an aqueous lithium borate solution is mixed with the lithium insertion compound cathode.

17. A method as claimed in claim 14 wherein a small amount of lithium borate is dry-mixed in a jar mill with media with the lithium insertion compound cathode.

18. A method as claimed in claim 14 wherein the amount of lithium borate is greater than about 0.01%, but less than 2% of the weight of the lithium transition metal oxide cathode.

19. A method as claimed in claim 14 wherein the lithium insertion compound cathode is a lithium transition metal cathode with LiCoO_2 type structure.

20. A method as claimed in claim 14 wherein the lithium transition metal oxide is a member of the solid solution series $\text{LiNi}_x\text{Co}_{1-x}\text{O}_2$ ($0 \leq x \leq 1$).

21. A method as claimed in claim 14 wherein the lithium transition metal oxide is LiCoO_2 .

22. A method as claimed in claim 14 wherein the anode comprises a carbonaceous insertion compound.

23. A method as claimed in claim 22 wherein the carbonaceous insertion compound is graphite.

24. A method as claimed in claim 14 wherein the lithium salt is LiPF_6 .

25. A method as claimed in claim 14 wherein the non-aqueous solvent comprises a cyclic and/or linear organic carbonate.

26. A method as claimed in claim 25 wherein the non-aqueous solvent is a mixture of ethylene carbonate, propylene carbonate, diethyl carbonate, ethyl methyl carbonate, and dimethyl carbonate.